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Dynamics of the Martian bow shock location

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The Martian interaction with the solar wind is unique due to the influence of multiple internal and external drivers, including remanent crustal magnetic fields that make the interaction unique. In this work we focus on the analysis of the dynamics of the plasma boundaries that shape the interaction of the planet with its environment, and in particular of the shock whose location varies in a complex way. We use multi spacecraft datasets from three missions (Mars Global Surveyor, Mars Express, Mars Atm-osphere and Volatile Evolution) to provide a coherent picture of the shock drivers. We show how the use of different statistical parameters or cross correlations may modify conclusions. We thus propose the use of refined methods, such as partial correlation analysis or Akaike Information Criterion approach to analyse the multiple drivers of the shock location and rank their relative importance: solar wind dynamic pressure, extreme ultraviolet fluxes, magnetosonic mach number, crustal magnetic fields, but also solar wind orientation parameters. Seasonal effects of crustal fields on the shock, through ionospheric coupling, are also investigated.